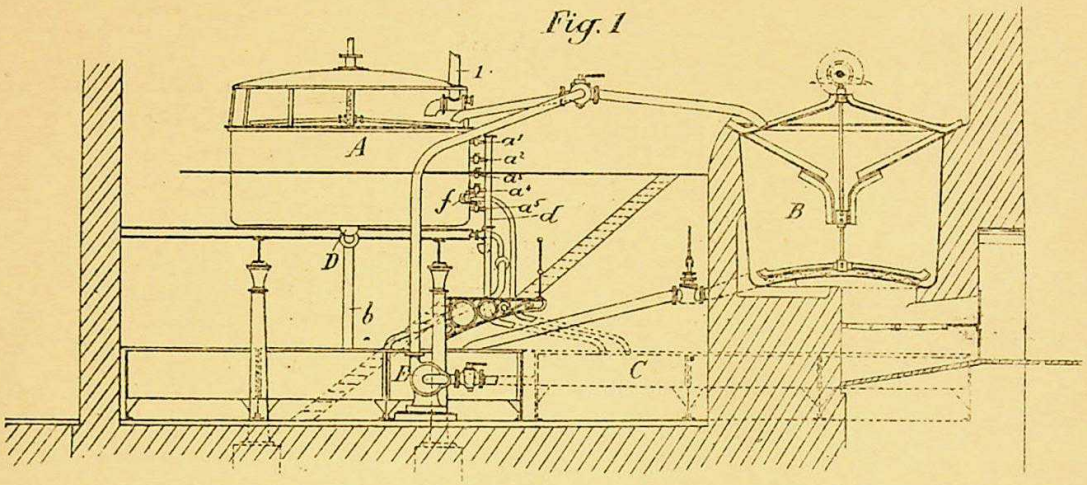
195. ALCOHOL.
Machine Apparatus.

Prochazka BRITISH 14,919 OF 1894

1895

(1 SHEET)

Fig. 1



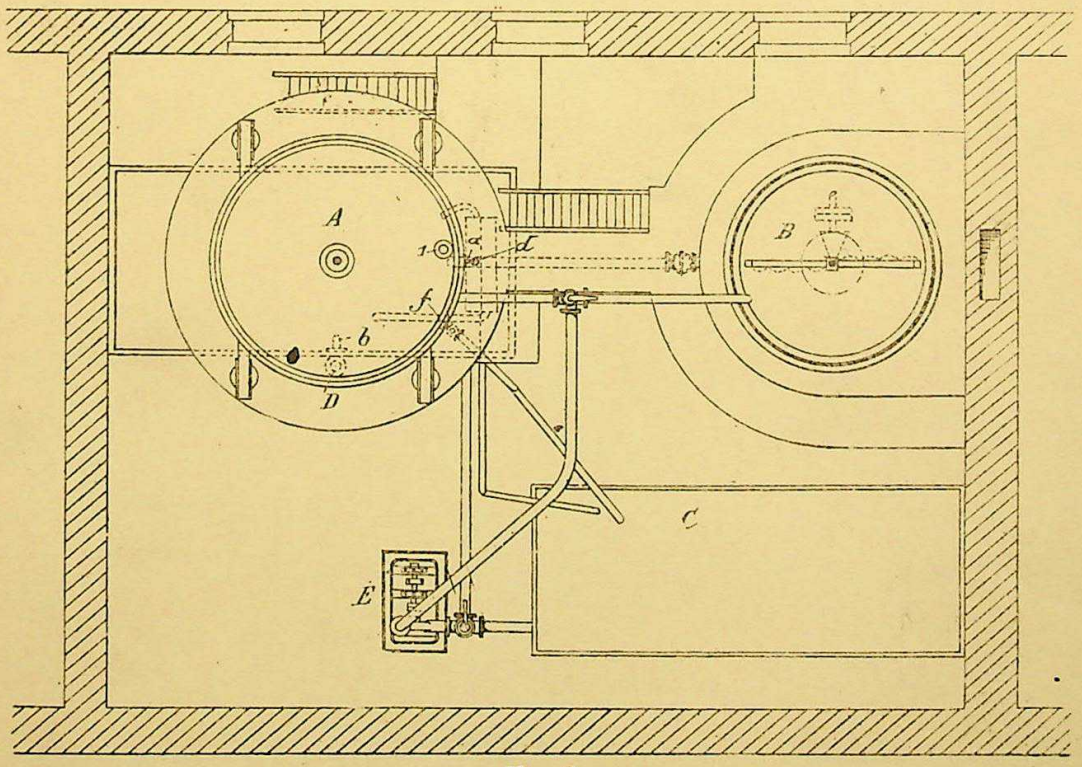


Fig. 2

A.D. 1894. Aug. 3. No. 14,919.
PROCHAZKA'S Complete Specification.

99. FOODS AND BEVERAGES
426/29
1895
5/10
RECORDED

N° 14,919 A.D. 1894

DUPLICATE

Date of Application, 3rd Aug., 1894
Complete Specification Left, 18th Feb., 1895—Accepted, 3rd Sept., 1895

PROVISIONAL SPECIFICATION.

An Improved Process and Appliances for Mashing and Brewing in Breweries.

I, LADISLAUS PROCHAZKA, Brewer, of 706 Jablouski Gasse in the City of Prague, Austro-Hungarian Empire do hereby declare the nature of this invention to be as follows:—

When using malt of poor diastase in the brewing process, cloudings of starch-paste or starch-flour and dextrine often appear in the beer, consequently brewers are obliged to avoid the use of malt of less than 500 diastastic power and it is best that malt of not less than 600 diastase should be employed.

The object of my invention is to avoid this trouble and even to enable malt of only 400 diastase to be employed while at the same the yield of extract is increased.

In my process the mashing of the grains of malt takes place at different temperatures, at about 43° C. or 62° C. according to the kinds of beer to be brewed. Starting with the latter temperature a given quantity of malt is put into a certain quantity of water of 62° C. in a vessel and an equal quantity in another vessel which latter is to be heated by direct fire until brought to boiling point, then the latter mash is also put in the first vessel, when the temperature is gradually raised to 70° C., then allowed to cool down to 65° C. in the first vessel.

The whole is then left to settle in the first vessel in order to separate the malt extract from the spent malt, when the malt extract is drawn off to the brewing pan.

Since malt extract cannot be well drawn off through a layer of spent malt at the bottom of the first vessel or the mashing and clarification tub; side openings with sieves and cocks are provided to facilitate this process.

There remain in the mashing and clarification tub all the spent malt and some of the malt extract, on to which very nearly boiling water is pumped from the second vessel in order to raise the temperature to not exceeding 75° C., thus enabling the diastase to exert itself before the spent malt is boiled. This water replaces the existing malt extract through the clarification battery to the brewing pan. After this malt extract has been removed to the brewing pan, the remaining spent malt, mixed with sufficient water, is raked up thoroughly and emptied into the second vessel, when it is brought to boiling temperature and then pumped in sections into the first vessel, where now all the extract and other matters which have in the meantime also been put back from the brewing vessel to the first vessel, are united at a temperature of about 70° C. and are exposed to the unweakened diastase.

This mash is now treated in two halves. The thin mash is let off into the hop strainer underneath the first vessel and then the first half is carried to the second vessel when it is gradually brought to boiling point.

Meanwhile the remaining mash from the first vessel is run off into the brewing pan. At the same time the first half is carried from the second vessel where it has been boiling, back to the first vessel.

Now after the second half from the brewing pan is let off into the second vessel, the brewing pan will be thoroughly cleaned. Thus the first half, after the spent malt has settled down, will be clarified into the brewing pan.

[*Price 8d.*]

As soon as the first wort has passed into the brewing pan, the second half of the entire mash is raised to a temperature of 75° and then brought to boiling temperature in the second pan, and pumped on the dry and raked spent malt of the first half in the first vessel.

After settling again a clarification with boiling water takes place through the layer of spent malt, clarification bottom and clarification battery to the brewing pan, thus removing all the salts and other objectionable substances.

The object of the high final temperature of 100° C. is to avoid entirely any subsequent transformation of the formed iso-maltose into maltose.

By boiling the entire mash before clarification the diastase is destroyed and not a trace of it reaches the clarification vessel. In this latter during clarification only the physical process of extraction takes place, while by the process hitherto in use, in the presence of diastase during clarification, the starch flour products of the unboiled spent malt were subjected for several hours to the influence of the diastase and at a temperature favorable to the formation of undesired chemical changes, so that only such material gets into the wort as later on causes starch-paste cloudings in the beer when it becomes older. Thus it is explained that by infusion now in use granulous material causing starch paste cloudings unavoidably gets into the wort, to avoid which all efforts heretofore have been unavailing.

A dissolution of the starch-flour in the spent malt is avoided by my process under all circumstances, in consequence of the absence of diastase during the clarification and purification process of the spent malt, by which the wort is kept free from all contagion.

Since boiled spent malt husks act as a better filtering medium, than the unboiled husks obtained in the infusion process, I secure by my process a material, greatly facilitating an easy filtration during clarification and edulcoration.

Dated this 3rd day August 1894.

S. S. BROMHEAD,
97 Newgate Street, London, E.C., Agent for Applicant.

COMPLETE SPECIFICATION.

An Improved Process and Appliances for Mashing and Brewing in Breweries.

I, LADISLAUS PROCHAZKA, Master Brewer, of Türnau, Bohemia, Austro-Hungarian Empire, formerly of 706 Jablouski Gasse, City of Prague in the Austro-Hungarian Empire do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This mashing and boiling process has for its object to utilise malt in a rational manner and in accordance with scientific knowledge thereon, while the progress of the chemical changes, during the preparation of the wort, may be practically controlled and regulated according to requirement.

Inasmuch as this renders it possible to predetermine the constitution of the resulting beer-production, it is obvious that by my process all the mishaps that have hitherto been experienced, *e.g.*, turbidity from dextrine starch and gluten, may now be eliminated, and the production of durable, ripe, and well-flavoured beer, of full age, may be ensured.

An especial and pre-eminent feature of my process which I may particularly emphasize is the fact, that the most valuable constituent of the malt, namely diastase, is most carefully protected and preserved during the sweetening process.

Free diastase is entirely converted, by boiling, before the sweetening process, so that its presence—which would be detrimental during purification, at the temperatures of from 70° to 75° C. and upwards, for the tail waters—is avoided ;

and consequently, by reason of this improved method, varieties of malt susceptible of rapid treatment and, above all, poor in diastase may be employed without fear, in brewing.

My process is carried out as follows; and, by way of example, a boiling of 82·5 hectolitres for the first contents of the boiling-pan, and a second filling of 68 hectolitres, for 9103 lbs. of malt-grist and 2462 lbs. of starch-sugar.

The mash-tub A (see drawing) is heated as usual with hot-water, which is then run off, and fresh hot-water is admitted under the strainer so as to cover it and prevent the perforations from being stopped up.

It need only be premised that the existing English plant for the boiling process may be utilised for my improved process; only that the boiling-pan B must be situated over an open fire, and provided with a more powerful stirring apparatus, for boiling thick mash, but in case the plant has been erected for the steaming process, a new thick-mash pan with stirring apparatus must be erected in addition to the existing hop-boiling pan over an open fire.

In the arrangement herein taken as an example the former case is assumed, and the existing connections are arranged as necessary for the conveyance of the mash and wort.

In other respects, as hitherto customary, the measure of malt for the brewing is passed through a preliminary mashing, at a temperature for the mash of 43° or 62° C., in the mash-tub, that is to say, at 43° for kinds of beer rich in maltose, and at 62° for those rich in dextrine.

With hot-water flowing through the strainer or through the tail-water cross (a cross made of perforated pipes, and rotatable), with a temperature of 75° C., or when the mash-machine is in extra active work, close upon 100° C., the mash itself is raised to from 51° to 70° C.; and, to avoid confusion from two different temperatures being employed for two different cases, we will assume the latter-named case, *i.e.*, where wort, rich in dextrine, is employed in the production of beer which shall preserve its "body" better.

After an hour's mashing, the mash-machine is left to stand, and in proportion as the grains gradually settle down from above, is the turbid fluid, or malt extract, drawn off by the cocks a^1 a^2 a^3 a^4 a^5 successively, and conducted by the collecting pipe d to the hop-strainer C: leaving only the deposited grains.

Inasmuch as, to the above-named measure of 9103 lbs. of malt, required for a brewing a volume of - - - 26·4 hectolitres
is added, and water from the preliminary mashing and heating to 70° C. through the strainer and the rotating cross, make up 139·7 do.
the quantity of mash in the mash-tub is, in round numbers - 166· do.

After running off the malt-extract, the volume of the malt amounts to - - - - - - - 26·4 do.
and the same quantity of malt extract retained - - - 26·4 do.

Then deducting together 52·8 hectolitres from the above total 166·0 hectolitres leaves for the quantity of malt extract run away - - - - - - - - 113·2 do.

In order to recover the malt-extract retained in the grains, amount in volume to - - - - - - 26·4 do.
an equivalent quantity (26·4 hectolitres) of water at a temperature of 80° C. is allowed to flow over the grains so that the quantity of malt-extract retained therein may be forced through the strainer into the drawing-off device (a^1 a^2 . . . . .) *i.e.* - - - - - - 26·4 do.
and drawn off to join the other - - - - - 139·6 do.
of malt-extract or 140 hectolitres in round numbers.

In the mash-tub there remains 52·8 hectolitres and this is called the "grains-mash" and it consists of 26·4 hectolitres grains and 26·4 hectolitres of water.

This grains mash by the working of the mash-machine and through the opened valve D in the bottom of the mash-tub and the connecting pipe b with the aid of the

pump E is driven into the boiling pan B and there slowly heated to 75° C., and thence slowly brought to the boiling point 100° C.; whereby the following result is obtained, the mass of starch-meal is converted into sugar at 75° C. melted at a temperature exceeding 75° C., and at 100° C. and by means of the diastase in the grain is converted into a pasty mass.

In the meantime, the malt-extract is returned from the hop-strainer C to the mash-tub A, and the grains-mash boiled meanwhile in the boiling pan is pumped intermittently in three parts into the mash-tub by an energetic working of the mash-machine, alternately with the undiluted diastase in the malt extract.

The first part of the grains mash is pumped up with a final temperature of 65° C.
The second do. do. do. 66° C.
The third do. do. do. 67° C.

Therewith the pasty grains-mash together with the mass of boiled-down grains is added to the unweakened diastase, at a temperature of 70° C. if the beer is rich in dextrine or of 51° C. if the beer is rich in maltose. whereupon the complete conversion into sugar of the whole of the starch-meal contained in the grains follows.

The entire mash, *i.e.*, 163 + 60 = 223 − 55 hectolitres leaving 168 hectolitres in two halves of 84 hectolitres each, is transferred successively to the empty boiling-pan, the first half containing the most grains, because thin mash is passed into the hop-strainer through *f* whence the remainder namely the first half in the mash-tub contains more grains; in mashing off this second half from the mash-tub, it is transferred into the under-back and thence pumped by E into the boiling-pan B.

In this, the first half is slowly heated up to 75° C., and thence slowly up to 100° C. and thus brought to boil. Meanwhile the thin mash from the hop-strainer C is returned to the mash-tub, whence it is run off through valve D into the under-back (of well-known construction, and not shown in the drawings). Then the mash-tub is cleaned out, the strainer is raised and relaid, and all dirty water and meal-particles run off into the second half of the mash in the under-back.

Meanwhile the first half, in a boiling state is transferred from the boiling-pan B to the cleansed and prepared mash-tub A, and, when the grains have settled on the strainer C, is at once run off into the under-back the chief cock in the clearing or drawing-off arrangement is turned off when the first-wort runs clear, and the second half-mash is then pumped from the under-back into the empty boiling-pan B, there slowly heated to 75° C., and then slowly raised to 100° and brought to boil.

In the meantime the under-back is cleaned, and the liquid added to the second half-mash; and now the interrupted discharge of the first wort, through the running-off apparatus, into the boiling-pan is resumed by opening the main-cock, and completed until the grains are dry. The cocks are thereupon closed, and the second half-mash in a boiling state, is pumped on the grains of the first half-mash, by the aid of the mash-machine, and, after the grains have been allowed to settle, is drawn off into the under-back, and thence pumped into the previously cleaned boiling-pan B, and mixed with the first wort.

As soon as the grains are clear, the cocks are once more closed, and the grains broken up, sparged by means of the rotating cross and then together with hot water (to 100° C.) and the second wort pumped into the underback and thence pumped into the boiling first wort, with which, in the meantime, hops have already been mixed.

By boiling off the first and second halves of the mash, the diastase, after having first completely converted the starch-meal is itself converted or neutralised, so that no liquefaction of the starch-meal can occur in the grains, and thereby turbidity through dextrine and paste.

Inasmuch as the sparging water can be used and applied at any temperature up to 100° C., without any such detrimental effects as have hitherto been unavoidable, as, for instance, that pasty starch appears in the wort, but only having its most advantageous effect in the better solution of the extract, a consequently improved extract is obtained.

When, moreover, by boiling all the grains or spent malt-husks, these shrink and contract, and therefore retain less wort, and a less quantity of sparging water is required for the edulcoration, it will be obvious that, through the combination of all these favourable conditions the extraction is incomparably greater than that obtained from infusion and all the processes hitherto adopted, as shown by the following table :

	Diastase.		Grains.	
With infusion -	0 % nullified	100 % not nullified	0 % boiled off	100 % not boiled off
„ two thick mashes.	56 % „	44 % not nullified	56 % boiled off	44 % not boiled off
„ three thick mashes.	72 % „	28 % not nullified	72 % boiled off	28 % not boiled off
„ my processes	100 % „	0 % not nullified	100 % boiled off	0 % not boiled off

It is also evident, from the foregoing table, that none of the preceding processes so fulfils these requirements as mine.

The accompanying drawings illustrate a typical English brewery, for the boiling process, adapted to the carrying out of my process :—

Figure 1 being a side elevation, partly in section, and

Figure 2 a ground plan of the works.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is :—

1. In a thick-mash and boiling process for the manufacture of beer the separation, before the completion of the saccharification, of the grains from the malt-extract in the entire mash-product in order to bring all the grains to the boiling point without detriment to the diastatic strength of the malt-extract, and to obtain in the latter its full diastatic strength, substantially as described.

2. In a thick-mash and boiling process for the manufacture of beer mixing the grains after boiling with the malt extract, and after the saccharification is effected drawing off and clarifying the whole mash freed from all trace of diastase substantially as described.

3. In a thick mash and boiling process for the manufacture of beer the sparging and edulcoration with water at or near boiling point substantially as described.

Dated this 18th day of February 1895.

BOULT & WADE,
Agents for the Applicant.

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